Abstract Submitted
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The metal insulator transition in self-assembled gold nanoparticle wires M. E. REEVES, JIANWEI SUN, George Washington University, J. A. HOFFMANN, Applied Physics Laboratory, JASPER NIJDAM, George Washington University, GUEBRE TESSEMA, National Science Foundation, GWU/NP COLLABORATION — We report the temperature dependence of wires assembled from spherical nanoparticles by a relatively new technique, vertical colloidal deposition. This is a simple, one-step method for assembling spherical nanoparticles into wires without the need for lithographic templating. It is effective for a variety of conducting and nonconducting nanoparticles and substrates, and the only material requirement is that the nanoparticles be placed in a colloidal suspension that is wettable on the desired substrate. The shape of the meniscus defines the wire's geometry, and we report the synthesis and physical properties of wires several millimeters long by a few micrometers wide. When wires are formed from 12 nm gold nanoparticles, they exhibit a weak metallic temperature dependence. Those assembled from 6 nm nanoparticles show activated behavior. Post-processing also effects the conductivity of the nanoparticle wires, such as when they are intercalated with proteins or other short organic molecules. Evidence for the metal insulator transition in these materials will be presented and discussed.

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